



THE BUSINESS COUNCIL FOR SUSTAINABLE ENERGY



U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

# **Expanding Markets for Clean Energy:**

## **The Role of Regional Market-Based Mechanisms in North America**

**May 2004**

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## Abbreviations

|                   |   |
|-------------------|---|
| CCX               | Chicago Climate Exchange                                |
| CDM               | Clean Development Mechanism, through the Kyoto Protocol |
| CEC               | North American Commission for Environmental Cooperation |
| CER               | Certified Emission Reduction                            |
| CFE               | Federal Electricity Commission in Mexico                |
| CO <sub>2</sub>   | Carbon dioxide  |
| CO <sub>2</sub> e | Carbon dioxide equivalent                               |
| CONAE             | National Commission for Energy Conservation in Mexico   |
| CRS               | Center for Resource Solutions                           |
| EIA               | Energy Information Administration                       |
| FERC              | Federal Energy Regulatory Commission                    |
| GDP               | Gross Domestic Product                                  |
| GHG               | Greenhouse Gas  |
| GWh               | Gigawatt-hour   |
| Hg                | Mercury   |
| IPCC              | Intergovernmental Panel on Climate Change               |
| IPP               | Independent Power Producer                              |
| KWh               | Kilowatt-hour   |
| LFC               | Luz y Fuerza Centro, serving Mexico City                |
| Mt                | Megatonnes  |
| MW                | Megawatt  |
| NAAIB             | North American Association of Issuing Bodies            |
| NAFTA             | North American Free Trade Agreement                     |
| NESCAUM           | Northeast States for Coordinated Air Use Management     |
| NO <sub>x</sub>   | Nitrogen oxides   |
| Pemex             | Petroles Mexicanos, a Mexican state oil company         |
| REC               | Renewable Energy Certificate                            |
| RPS               | Renewable Portfolio Standard                            |
| SO <sub>2</sub>   | Sulfur dioxide  |
| US                | United States   |
| USAID             | US Agency for International Development                 |
| \$                | US dollar   |

## **EXPANDING MARKETS FOR CLEAN ENERGY: THE ROLE OF REGIONAL MARKET-BASED MECHANISMS IN NORTH AMERICA**

BUSINESS COUNCIL FOR SUSTAINABLE ENERGY

MAY 2004

### **EXECUTIVE SUMMARY**

Given the increasing integration of North American energy markets and the expected rise in energy demand over the next several decades, it is critical that regional approaches be considered to encourage new clean energy generation and greenhouse gas emissions management. *Expanding Markets for Clean Energy: The Role of Regional Market-Based Mechanisms in North America* focuses on market-based programs, such as greenhouse gas emissions trading and renewable energy crediting trading. It considers how these policies can be applied in the region – with a strong focus on the challenges and benefits for Mexico.

One of the most pressing environmental challenges facing the world today is global climate change. Greenhouse gas emissions are contributing to the warming of the earth's surface and are associated with potentially degrading impacts on human health, land management and animal life. While adopting distinct national strategies, the United States, Mexico and Canada share the goal of addressing climate change and meeting growing energy demand without curtailing domestic economic growth. Since greenhouse gas emissions have a global impact, reduction activities inside and outside national and regional borders have the same positive environmental effect. This provides a strong rationale for national, regional and global market-based programs that facilitate emissions reduction at the lowest cost to society.

The North American electricity sector is a leading source of regional greenhouse gas emissions. It is the largest source of carbon dioxide (CO<sub>2</sub>) emissions (the most prevalent greenhouse gas) in Canada and the US and is a strong contributor to Mexico's CO<sub>2</sub> emissions. Deployment of clean energy technologies, especially renewable energy, can play a strong role in reducing North America's greenhouse gas emissions intensity. Increased renewable energy generation is a component of climate change strategies in the region.

Market-based initiatives that provide a financial value for improved environmental performance could assist all three countries in meeting their common environmental goals. For Mexico, a developing economy, this is especially important. Mexico is expected to require \$50 billion in energy sector investment over the next ten years to meet its growing electricity needs. It also suffers from serious air pollution, especially in urban areas like Mexico City and Guadalajara.

Though Mexico has large renewable energy resources, it is mainly a fossil fuel producer and exporter. As part of its ten-year national energy strategy, Mexico is planning to decrease its oil-based generation and dramatically increase its clean energy generation, with natural gas. This strategy offers a range of opportunities to generate CO<sub>2</sub> credits, depending on how Mexico's emissions baseline is set under a trading or crediting program. Similarly, if renewable energy certificates (RECs) generated in Mexico are eligible under voluntary or mandatory RECs trading programs in the US or Canada, Mexico could receive additional funds for its power development.

Greenhouse gas emissions trading and credit trading programs are being considered by all three governments to reduce emissions. Canada and Mexico are preparing to participate in the Kyoto

Protocol's market-based mechanisms. In the US, voluntary emissions trading is continuing, and several states are looking at market mechanisms as a way to meet their voluntary and, in some cases mandatory, emissions reduction targets.

RECs trading facilitates the transfer of commodities that represent the environmental attributes of renewable power generation. RECs are most commonly associated with Renewable Portfolio Standards (RPS), which set targets and timetables for increased generation of renewable energy. Fourteen states in the US and the Province of Québec have adopted some form of RPS. At least seven US RPS programs permit RECs trading.

Given the wide support for increased renewable energy development in North America, development of a regional RECs market might provide more near-term results than would consideration of regional greenhouse gas emissions trading. Further, the institutional framework required for a credible North American RECs market could lay the foundation for a regional greenhouse gas trading program in the future.

A key to a cleaner energy development path for all three nations involves transparent, coordinated and consistent environmental management. Even with differing regulatory foundations and resource capacity, national regulatory agencies working bilaterally and in partnership with regional institutions such as the North American Commission for Environmental Cooperation can help build the infrastructure for market-based mechanisms aimed at common objectives.

The following recommendations are offered to advance consideration of regional market-based programs to increase renewable energy generation and to reduce greenhouse gas emissions:

- When assessing models for regional market-based programs, the following criteria should be sought:
  - strong and credible institutions;
  - flexible program design;
  - economic development and energy development plans
  - broad-based political support at national and local levels; and
  - use of existing regional frameworks.
- A regional renewable energy certificate and greenhouse gas trading accounting system should be developed in North America. The accounting system should provide a transparent issuing, tracking and certification platform. The establishment of the accounting system would not require agreement on a North American greenhouse gas strategy nor an RPS; it would merely facilitate the transfer of environmental commodities in the region.
- Quantitative analysis should be undertaken to assess the dynamic impacts of RECs trading and greenhouse gas credit and emissions trading in North America – a particular focus should be given to these impacts on Mexico's economy and electricity markets.

## Introduction

With the adoption of the North American Free Trade Agreement (NAFTA) and more interdependent power markets, regional approaches to address environmental issues have been given increased consideration in North America. This is evident through the bilateral and regional efforts underway in the region to tackle air pollution, water quality and global climate change. This collaboration is most advanced in the border areas.

One of the most pressing environmental challenges facing the world today is global climate change. Greenhouse gas emissions are contributing to the warming of the earth's surface and are associated with potentially degrading impacts on human health, land management and animal life. According to the Intergovernmental Panel on Climate Change (IPCC), climate change could result in severe weather events in North America, altering the current landscape, damaging farmlands and ecosystems and bringing new illnesses to the region – all with serious economic impacts.<sup>1</sup>

Global climate change is a top environmental concern for the region. While adopting distinct national strategies, the United States, Mexico and Canada share the goal of addressing climate change and meeting growing energy demand, without curtailing domestic economic growth. Each country has programs to address climate change, including vehicles that reduce greenhouse gas emissions and increase the use of clean energy technologies and fuels such as natural gas, energy efficiency and renewable energy.

Market-based mechanisms, such as emissions trading and credit trading, are also being explored as a means to achieve these goals. Canada and Mexico, as Parties to the Kyoto Protocol, are eligible to participate in the treaty's market-based programs.<sup>2</sup> The institutional framework is under development for a Canadian greenhouse gas emissions trading program and Mexico is preparing to participate in greenhouse gas credit trading programs. In the US, a mix of state-mandated and voluntary market-based programs are being tested. With or without ratification of the Kyoto Protocol, these programs could lay the foundation for regional, market-based efforts to address climate change.

The North American electricity sector is a leading source of regional greenhouse gas emissions. It is the largest source of carbon dioxide (CO<sub>2</sub>) emissions (the most prevalent greenhouse gas) in Canada and the US and is a strong contributor to Mexico's CO<sub>2</sub> emissions. The US is expected to be a growing energy importer from its neighbors, which could result in increased greenhouse gas emissions in Canada and Mexico in the future.

Deployment of clean energy, especially renewable energy technologies,<sup>3</sup> plays a strong role in reducing North America's greenhouse gas emissions intensity. As such, increased renewable energy generation is a component of climate change strategies in Canada, Mexico and the US. In the last several years, new market-based programs have been adopted in the US and Canada to expand

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<sup>1</sup> Robert T. Watson, Marufu C. Zinyowera, and Richard H. Moss, eds. *The Regional Impacts of Climate Change: An Assessment of Vulnerability*. The Intergovernmental Panel on Climate Change (Cambridge, England, Cambridge University Press: 1997).

<sup>2</sup> If the Kyoto Protocol enters into force, Mexico will be eligible to participate in the treaty's Clean Development Mechanism (CDM), a credit trading program between developed and developing countries. Canada will be eligible to participate in the Kyoto Protocol's emissions trading program, joint implementation program and the CDM. For more information on the Kyoto Protocol, please see [www.unfccc.int](http://www.unfccc.int)

<sup>3</sup> For the purpose of the paper, renewable energy is defined as any energy source for which the rate at which it is available in perpetuity exceeds the rate at which it is consumed.

renewable energy generation. Specifically, Renewable Portfolio Standards (RPS) have shown that market-based policies can drive rapid deployment of renewable energy technologies at a lower-than-expected cost.

RPS programs and other market-based initiatives that provide a financial value for improved environmental performance could assist all three countries in meeting their common environmental goals. For Mexico, a developing economy, this is especially important. Mexico is expected to require \$50 billion in energy sector investment over the next ten years to meet its growing electricity needs.<sup>4</sup> Without this influx of capital, economic growth may be impeded and millions of rural households will remain without access to electric power.

In addition, market-based programs could provide economic benefits to Mexico. Given the localized nature of renewable energy generation and Mexico's strong manufacturing capacity, expansion could result in the birth of a new industrial niche. A Mexican renewable energy industry would be well positioned to serve domestic as well as export markets with less polluting energy.

Given these regional dynamics, policymakers and the business community are considering expansion of market-based programs to serve multiple objectives:

- to improve the local and global environment;
- to reduce the cost and drive the deployment of low- and zero-emitting energy technologies; and
- to spur economic growth with the creation of high-quality jobs and clean energy exports.

Following a successful industry roundtable convened by the Business Council for Sustainable Energy and the USAID in late 2001 on Western Hemispheric Emissions Trading, this paper will discuss emerging greenhouse gas emissions trading and renewable energy credit trading programs in North America and explore vehicles to incorporate such programs in a regional context, such as:

- market-based initiatives identified by the NAFTA's environmental body, the North American Commission for Environmental Cooperation;
- expansion and linkage with US state renewable energy credit trading programs; and
- linkages with emerging voluntary and project-based greenhouse gas crediting and trading programs.

Section 1 discusses trends in North American energy markets and the region's emissions profile. Section 2 provides an overview of Mexico's electricity market and its electricity-related emissions, and considers how regional greenhouse gas and renewable energy credit trading programs may benefit Mexico's energy infrastructure, economy and environment. Section 3 looks at existing and emerging market-based programs geared toward greenhouse gas emissions management and new renewable energy generation. These programs may serve as models for bi-lateral and regional programs in North America. Section 4 analyzes vehicles to incorporate or expand market-based programs in the region. The conclusion offers recommendations as well as issues for further analysis.

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<sup>4</sup> Energy Information Administration. "Country Analysis Briefs: Mexico." March 2004. Internet online. Available from <<http://www.eia.doe.gov/emeu/cabs/canada.html#elec>> [April 8, 2004].



### **BCSE Industry Roundtable Series**

Since the late 1990s, the Business Council for Sustainable Energy has held more than 20 industry roundtables on global environmental issues and clean energy market development. Participants have included industry executives, representatives from the financial and legal sectors, government officials and other stakeholders. Nearly all of the roundtables have focused on market-based mechanisms. The most recent roundtable was held in February 2004 and focused on clean energy financing at multilateral lending institutions such as the World Bank and the Inter-American Development Bank. The next roundtable is scheduled for June 2004 and will focus on renewable energy credit trading.

## **1. Trends in North American Power Markets and Emissions**

North American power markets are going through unprecedented change.. The introduction of competitive electricity markets, increased cross-border trade in electricity and new environmental challenges are shaping the sector. The forces that are defining North American energy markets could also work in the environmental arena to efficiently improve local and global environmental quality.

The following section discusses shifts in the structure of North American power markets and the sources of North American electricity generation. It also looks at North America's major electricity-related emissions and briefly touches upon experiences with several market-based programs in the region.

### *1.1 Competition*

Over the last decade, North America has begun to experiment with competitive and deregulated<sup>5</sup> electricity markets. Moving away from government-models and vertically-integrated electricity systems, deregulation has been introduced or is under consideration in some form in Canada, Mexico and the US. While adopting varied approaches and scopes, there is a growing understanding that private sector involvement fosters competition in the industry, which holds the promise of lower cost and more efficient power service for customers.

The US Federal Energy Regulatory Commission (FERC) opened the door to competitive electricity markets in the US in 1996.<sup>6</sup> Following FERC's action, legislation or regulatory orders promoting competition have passed in at least 16 states and the District of Columbia. Today, over half of the electricity provided to consumers in the US comes from deregulated markets; competitive power suppliers own and operate approximately 36 percent of US-installed generating capacity.<sup>7</sup> Electricity deregulation is also under consideration at the national level as part of President George W. Bush's national energy strategy and the national energy legislation in the US Congress.

In Canada, the provinces have jurisdiction over electricity markets. Alberta and Ontario, representing over half of Canada's electricity consumers, opened their markets to competition in 2000.<sup>89</sup>

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<sup>5</sup> The introduction of competitive forces into the electricity sector is referred to as electricity restructuring and deregulation. These terms will be used interchangeably.

<sup>6</sup> In 1996, FERC promulgated Order 888 that requires all public utilities to offer non-discriminatory transmission service.

<sup>7</sup> Electric Power Supply Association. Internet online. Available from <[http://www.epsa.org/Competition/quick\\_facts.cfm](http://www.epsa.org/Competition/quick_facts.cfm)> [March 11, 2004].

<sup>8</sup> Energy Information Administration. "Country Analysis Briefs: Canada." January 2004. Internet online. Available from <<http://www.eia.doe.gov/emeu/cabs/canada.html#elec>> [March 8, 2004].

In contrast to the US and Canada, government-owned and controlled energy companies dominate the Mexican electricity market. However, upon taking office in 2000, Mexican President Vicente Fox made electricity reform one of his top policy priorities. But disputes with the Mexican Congress have blocked many of his proposals. Today, Mexico allows only limited opportunities for private sector involvement in its electricity sector (*see the Mexico Electricity Markets section for more information*).

While interest in competitive electricity markets remains on the policy agenda, new deregulation efforts have stalled in recent years. This is due to problems that erupted as a result of restructuring efforts in several North American localities, including the state of California and the Province of Ontario. Policymakers are now focused on improving market structures based on the lessons learned from these events. Despite these initial problems, regional interest in competitive electricity markets persists, although the adoption of new proposals has stalled.

## *1.2 Interdependence and Electricity Trade*

Another recent trend in North America is the growth of trade in electricity, leading to more interdependent power markets, as shown in Table 1. These shifts are due in part to the trade and investment rules provided under NAFTA in the 1990s.<sup>10</sup> Additionally, in 2001, the governments of Canada, Mexico and the US made commitments to further integrate electricity generation, transmission and distribution as a means to meet the region's growing energy demand.<sup>11</sup> The large-scale power outage in August 2003 demonstrates the current state of market integration in the region, as it left millions of customers in the Midwest and Northeast US and Ontario, Canada without power.

North American electricity trade is focused along national borders and is greatest between the US and Canada. The US is the dominant power importer, with a lesser degree of electricity exports moving to Canada. Most of Canada's exported electricity comes from the provinces of Québec, Ontario and New Brunswick to serve markets in the Northeast US. A smaller amount of electricity comes from British Columbia and Manitoba to serve customers in the Pacific Northwest and California.

Electricity trade between Mexico and the US has the potential to rise significantly as demand for electricity grows in western and southwestern states. Forecasting a new model, a 50-megawatt (MW) natural gas plant located in Baja California began exporting power to California in 2001. For now, trade is constrained due to the limited energy infrastructure linking the two countries. Mexico is connected to the US power grid in nine places, two in California and seven in Texas. Many new border connection projects are under development and a third connection to California is under construction.

Transmission capacity is also a barrier to increased trade. There are two primary transmission lines in the border region. For cross-border trade to meet its potential, large-scale investments are needed to expand interconnection and transmission capacity.

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<sup>9</sup> Of note Ontario closed its market to competition several months after it opened them due to a sharp rise in electricity rates.

<sup>10</sup> North American Commission for Environmental Cooperation. "Environmental Challenges and Opportunities of the Evolving North American Electricity Market: Status Report to the Council under Articles 13 of the North American Agreement on Environmental Cooperation." June 2002. Internet online. Available from <[http://www.cec.org/files/PDF//CEC\\_Art13electricity\\_Eng.pdf](http://www.cec.org/files/PDF//CEC_Art13electricity_Eng.pdf)> [February 15, 2004].

<sup>11</sup> Statement issued by U.S. President George W. Bush, Canadian Prime Minister Jean Chrétien and Mexican President Vicente Fox during the Summit of the Americas in Québec City. Internet online. Available from <<http://usinfo.state.gov/regional/ar/summit/north22.htm>> [March 5, 2004].

**Table 1 – United States Projected Gross Trade in Electricity (thousand GWh)**

|  | 1999        | 2000        | 2001        | 2002        | 2003        | 2004        | 2005        | 2006        | 2007        |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Imports from Canada and Mexico   | <b>38.9</b> | <b>47.9</b> | <b>48</b>   | <b>45.5</b> | <b>57.6</b> | <b>60.3</b> | <b>66.1</b> | <b>57.9</b> | <b>54</b>   |
| Gross Exports  | <b>13.5</b> | <b>13.0</b> | <b>13.1</b> | <b>13.1</b> | <b>12.7</b> | <b>16.6</b> | <b>16.7</b> | <b>16.8</b> | <b>16.9</b> |
| <b>Source: Energy Information Administration (EIA). Annual Energy Outlook, 2002.</b> |             |             |             |             |             |             |             |             |             |

The potential benefits of regional trade in electricity include:

- greater efficiency through reduced costs;
- improved system reliability with new energy infrastructure investments;
- enhanced energy security through growth in regional energy supply; and
- access to electricity in underserved regions.

However, the expansion of cross-border trade also presents challenges due to the environmental impacts of shifting and expanding electricity generation. This will be most evident along border areas and within air sheds. Air quality, habitat protection and global greenhouse gas emissions will be affected. Therefore, North America's increasingly integrated electricity markets provide a strong rationale for bilateral and regional management of environmental issues.

### *1.3 North America's Electricity Generation Profile*

North American electricity is generated largely through the combustion of fossil fuels. Despite large resource potentials, electricity generation from renewable energy sources, including wind, solar, and geothermal, range from one to three percent of generation in all three countries.<sup>12</sup> To address global climate change effectively, emissions from electricity generation will likely be part of national greenhouse gas management programs. To start, the use of low and zero-carbon clean energy technologies – especially renewable energy – should be encouraged.

- The US is the largest consumer and generator of energy in the region and the world, with more than 70 percent of its energy coming from the burning of fossil fuels and more than 50 percent of it coming from coal.<sup>13</sup>
- Canada has the largest hydropower capacity in the region, making up more than half of its electricity generation. However, nearly 30 percent of electricity generated in the country comes from fossil fuels, including oil, coal and natural gas.
- Mexico, while significantly smaller in generation capacity, relies on oil as its major energy source. This is expected to change over the next decade as it implements its national energy plan, *Prospectiva del Sector Eléctrico 2001-2010*. The plan calls for sharp increases in natural gas generation, using combined-cycle gas turbines, as well as the retirement and re-fueling of many of its oil plants to natural gas.

<sup>12</sup> Based on EIA data for 2001, Canada generated 1.3% from non-nuclear and large-scale hydropower renewable energy sources; the US generated 2% from wind, solar and geothermal sources. EIA data for 2000 indicates that Mexico generates about 3% of its electricity from solar, wind and biomass.

<sup>13</sup> Energy Information Administration. "Country Analysis Briefs: United States." October 2003. Internet online. Available from <<http://www.eia.doe.gov/emeu/cabs/usa.html>> [March 3, 2004].

#### 1.4 North America's Emissions Profile

Due to the heavy reliance on fossil fuels, North American electricity is one of the largest contributors to air pollution and greenhouse gas emissions in the region. It should be noted that each country's power generation profile is based on several evolutionary factors, including energy resource availability, regulatory frameworks and varying levels of economic development. However, as a region, electricity-related air and greenhouse gas emissions are a growing public concern.

In the US and Canada, electricity is the largest source of reported air pollutants, including nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>) and mercury (Hg). Electricity generation is also the leading source of CO<sub>2</sub> emissions in both countries. This is likely the case for Mexico as well.<sup>14</sup>

These emissions have serious environmental and health impacts. NO<sub>x</sub> and SO<sub>2</sub> emissions are the primary causes of acid rain and ozone, which can seriously degrade local air quality, human health and ecosystems. Mercury emissions contribute to brain damage in fetuses and learning disabilities in children.<sup>15</sup> CO<sub>2</sub> emissions contribute to global climate change and its associated degrading impacts on human populations and the environment.<sup>16</sup>

In a recent report assessing the environmental challenges of the North American electricity market, the Commission for Environmental Cooperation of North America (CEC) compiled air emissions data for Canada, Mexico and the US, as shown in Table 2. Looking at figures for 1998, the US is clearly the dominant source of air emissions in the region. However, while Mexico has the lowest emissions per capita, it has significant emissions intensity across the board – stemming from its largely oil-based electricity generation.

**Table 2: North American Emissions of Selected Air Pollutants from Electricity Generation**

|                           | <b>CO<sub>2</sub> Equivalent<br/>(metric tonnes)</b> | <b>Annual SO<sub>2</sub><br/>(metric tonnes)</b> | <b>Annual NO<sub>x</sub><br/>(metric tonnes)</b> | <b>Annual Hg<br/>(kg)</b> |
|---------------------------|--|--|--|---------------------------|
| <b>Canada</b>             | <b>122,000,000</b>                                   | <b>650,195</b>                                   | <b>290,211</b>                                   | <b>1,975</b>              |
| <b>Mexico</b>             | <b>92,095,882</b>                                    | <b>1,683,199</b>                                 | <b>280,931</b>                                   | <b>1,117</b>              |
| <b>United States</b>      | <b>2,331,958,813</b>                                 | <b>12,291,107</b>                                | <b>5,825,982</b>                                 | <b>39,241</b>             |
| <b>per capita</b>         |  |  |  |                           |
| <b>Canada</b>             | <b>4.033</b>   | <b>0.021</b>                                     | <b>0.010</b>                                     | <b>0.000</b>              |
| <b>Mexico</b>             | <b>0.918</b>   | <b>0.017</b>                                     | <b>0.003</b>                                     | <b>0.000</b>              |
| <b>United States</b>      | <b>8.637</b>   | <b>0.046</b>                                     | <b>0.022</b>                                     | <b>0.000</b>              |
| <b>per km<sup>2</sup></b> |  |  |  |                           |
| <b>Canada</b>             | <b>13.320</b>  | <b>0.071</b>                                     | <b>0.032</b>                                     | <b>0.000</b>              |
| <b>Mexico</b>             | <b>46.128</b>  | <b>0.862</b>                                     | <b>0.144</b>                                     | <b>0.001</b>              |
| <b>United States</b>      | <b>233.554</b>                                       | <b>1.231</b>                                     | <b>0.583</b>                                     | <b>0.004</b>              |

<sup>14</sup> North American Commission for Environmental Cooperation, "Environmental Challenges", 5.

<sup>15</sup> Please see the Power Scorecard for a description on toxic pollutants and their impacts on human health and the environment, <http://www.scorecard.org/>.

<sup>16</sup> Please see the US Environmental Protection Agency website for information on the impacts of greenhouse gas emissions and global climate change, <http://yosemite.epa.gov/oar/globalwarming.nsf/content/Impacts.html>

**Table 2: North American Emissions of Selected Air Pollutants from Electricity Generation**

|   | <b>CO<sub>2</sub> Equivalent<br/>(metric tonnes)</b> | <b>Annual SO<sub>2</sub><br/>(metric tonnes)<br/>per GWh</b> | <b>Annual NO<sub>x</sub><br/>(metric tonnes)</b> | <b>Annual Hg<br/>(kg)</b> |
|---|--|--|--|---------------------------|
| <b>Canada</b>   | <b>217.229</b>                                       | <b>1.158</b>   | <b>0.517</b>                                     | <b>0.004</b>              |
| <b>Mexico</b>   | <b>495.577</b>                                       | <b>9.259</b>   | <b>1.545</b>                                     | <b>0.005</b>              |
| <b>United States</b>  | <b>608.789</b>                                       | <b>3.209</b>   | <b>1.521</b>                                     | <b>0.010</b>              |
| Source: * Some data are estimates, and not all come from 1998. For further details, see CEC background paper: "Estimating Future Air Pollution from New Electric Power Generation." Commission for Environmental Cooperation, Paul Miller et. al. Montreal: 2002<br>Population and Land Mass – Canada <a href="http://www.statcan.ca">www.statcan.ca</a> ; Mexico (Mexico Economist County Profile 1998) and the United States (United States Economist County Profile 1999), Electricity Generation – IEA- <i>Electricity Information 2001</i> . |  |  |  |                           |

### 1.5 Experience with Market-Based Environmental Programs

Market-based approaches consist of voluntary or mandatory efforts that affect demand for, or supply of, an environmental commodity through price, regulation or information.<sup>17</sup> In contrast to traditional regulatory models that mandate specific control technology for compliance, market-based programs internalize the environmental costs of a given activity and create a financial value for compliance. Market-based programs take advantage of economic efficiencies and provide flexibility that permits entities to choose the best control option to achieve results – in many cases at a lower cost than traditional methods. Further, market-based programs often create financial incentives for over-performance, which can lead to technological innovation. Green pricing programs, allowance trading, and emissions or renewable energy credit trading are all examples of market-based programs.

Since the creation of the US Acid Rain Program in 1990, which employed an allowance trading program to reduce SO<sub>2</sub> emissions, a range of market-based programs have been experimented with in North America. Examples include: closed allowance trading or "cap and trade" programs to improve air and water quality; open credit trading to increase renewable energy generation; and voluntary emissions trading in Canada and the US to reduce greenhouse gas emissions.

Boosted by the positive results of many of these activities and the trans-boundary nature of many environmental challenges, cross-border and regional market-based initiatives are under discussion. For example, US-Canadian bilateral efforts are exploring the feasibility of cross-border emissions trading to reduce NO<sub>x</sub> and SO<sub>2</sub> emissions.<sup>18</sup> The US-Mexico Border Air Quality Strategy is considering pilot projects that will look at cross-border market-based programs. Regional institutions like the CEC are assessing prospects for market-based renewable energy programs. Further, since Canada and Mexico have ratified the Kyoto Protocol, they will be eligible to participate in its market-based programs should the treaty enter into force.<sup>19</sup>

<sup>17</sup> North American Commission for Environmental Cooperation. "Background Paper: Market-Based Mechanisms for Carbon Sequestration, Energy Efficiency and Renewable Energy in North America – What are the Options?" March 2004, 1.

<sup>18</sup> For more information on the US-Canada Border Air Quality Strategy, please see [http://www.ec.gc.ca/press/2003/030623\\_n\\_e.htm](http://www.ec.gc.ca/press/2003/030623_n_e.htm).

<sup>19</sup> The Kyoto Protocol permits emissions trading between parties with emission reduction requirements under the treaty (Article 17 of the Kyoto Protocol) and it allows for credit trading between parties with a reduction obligation and those parties that do not have reduction requirements through the Clean Development Mechanism (Article 12 of the Kyoto Protocol). Please see [www.unfccc.int](http://www.unfccc.int).

**The Success of Market-Based Approaches**  
***The US Acid Rain Program***

The SO<sub>2</sub> cap and trade program is often pointed to as an example of a successful market-based environmental program. Power plants that participated in its first phase of the program that started in 1995 surpassed their compliance targets by nearly 30 percent – at dramatically lower costs than were initially estimated.<sup>20</sup> Prior to the adoption of the Acid Rain Program, compliance costs were estimated to be between \$4 billion and \$8 billion. In practice, compliance costs under the program were closer to \$1 billion.<sup>21</sup>

The proliferation of market-based initiatives at state/provincial, federal, and bilateral levels demonstrate the growing comfort with these types of programs and a recognition of their ability to deliver lower cost results than traditional “command and control” regulatory models. Section 3 looks specifically at several market-based programs aimed at reducing greenhouse gas emissions and increasing renewable energy and considers their applications on a regional basis.

The next section provides an overview of Mexico’s electricity sector, its emissions profile and the potential benefits of participating in regional market-based programs to address climate change and increase renewable energy generation.

## **2. A Closer Look at Mexico: Electricity, Emissions and the Benefits of Market-Based Programs**

Mexico has large indigenous fossil fuel and renewable energy resources. However, as a major oil producer and exporter, its renewable energy potential has largely been overlooked.<sup>22</sup> To meet its growing energy demand over the next decade, Mexico is planning to decrease its oil-based generation and dramatically increase its natural gas generation, requiring significant capital infusion. In addition to its generation needs, air quality problems are creating public discontent, especially in Mexico City, Guadalajara and other urban areas. According the World Bank, green accounting shows that environmental degradation, which includes air pollution, is costing Mexico ten percent of its Gross Domestic Product (GDP) per year.<sup>23</sup> Pollution is hurting its economic competitiveness and its ability to attract investment.

Bilateral and regional, market-based programs focused on climate change and renewable energy, could increase financial flows to Mexico – helping to achieve economic, energy supply and environmental objectives.

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<sup>20</sup> U.S. Environmental Protection Agency. “Clearing the Air: The Facts About Capping and Trading Emissions.” Internet online. Available from <<http://www.epa.gov/airmarkets/articles/clearingtheair.pdf>> [March 15, 2004].

<sup>21</sup> Douglas Russell. “Design and Legal Considerations for North American Emissions Trading: Secretariat Report to Council on Article 13 of the North American Agreement on Environmental Cooperation.” June 2002. Internet online. Available from <[http://www.cec.org/files/PDF//8\\_emissions-e.pdf](http://www.cec.org/files/PDF//8_emissions-e.pdf)> [March 5, 2004], 11.

<sup>22</sup> 1997 – Balance Nacional de Energía. 1998.

<sup>23</sup> World Bank Group. “Mexico: Large-Scale Renewable Energy Project Development. A Global Environment Facility Project Brief.” February 2003. Internet online. Available from <[http://gefweb.org/Documents/Council\\_Documents/GEF\\_C21/CC\\_-\\_Mexico\\_-\\_Project\\_Document.pdf](http://gefweb.org/Documents/Council_Documents/GEF_C21/CC_-_Mexico_-_Project_Document.pdf)> [March 15, 2004], 6.

## *2.1 Mexico's Electricity Sector*

Despite attempts in the last several years to dramatically open its electricity market to the private sector, Mexico has maintained a largely nationalized power system.<sup>24</sup> The dominant government role in the sector is enshrined in the Mexican Constitution, which specifies that Mexico's power sector belongs exclusively to the state. Mexico has three primary generators:

- Mexico's state-owned federal electricity company, *Comisión Federal de Electricidad* (CFE)
- The state-owned *Luz y Fuerza Centro* servicing Mexico City (LFC)
- *Petroleos Mexicanos* (Pemex), the Mexican state oil company

CFE is the largest player in the electricity sector and generates more than 90 percent of Mexico's power. Pemex generates about four percent of the country's electricity and LFC follows with about two percent of generation.

In contrast to many other developing countries, nearly 95 percent of Mexican households are electrified. However, more than five million Mexicans, living mainly in rural communities, do not have access to power due to the high cost of grid expansion in those areas.<sup>25</sup>

To maintain economic growth, Mexican electricity demand is expected to increase by 6.7 percent annually, with demand in high-growth areas like Baja California forecasted to exceed eight percent growth per year. The Mexican government estimates that it will need \$50 billion in investment by 2010 to meet rising demand for energy services.<sup>26</sup> In an effort to keep up with present demand, Mexico imports energy, largely from the US. According to the Energy Information Administration (EIA), Mexico's energy imports in 2000 were projected at over two billion kilowatt hours.

## *2.2 Electricity Generation Profile*

Mexico's current generation mix is dominated by fossil fuels; specifically, by oil-fired power plants. In 2002, oil, natural gas and coal accounted for more than 75 percent of Mexico's generation. Hydropower accounted for about 17 percent of generation and other renewable energy sources like geothermal, wind, solar and biomass accounted for about three percent.<sup>27</sup> Geothermal is the second-most used renewable resource in the country, with installed capacity of 855 MW, while wind energy follows with two MW of installed capacity. Solar power is used mostly in off-grid applications like water heating. The National Commission for Energy Conservation in Mexico (CONAE)<sup>28</sup> estimates that over 13 MW of solar power is installed throughout the country.<sup>29</sup>

According to Mexico's national energy strategy, many oil-fired power plants will be re-powered to natural gas and almost all new plants developed in Mexico will be fueled with natural gas, utilizing

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<sup>24</sup> In 1992, Article 3 from "Ley de Servicio Público" was modified to allow IPPs to sell electricity to CFE. The first one was Merida III in 2000.

<sup>25</sup> Odón de Buen. "Green Energy Market in Mexico: Background and Proposal." National Commissions for Energy Conservation (Comisión Nacional para el Ahorro de Energía-CONAE) Internet online. Available from <<http://www.cec.org/files/PDF//Green-Energy2e.pdf>> [March 2002], 3.

<sup>26</sup> Energy Information Administration, *Mexico*.

<sup>27</sup> Energy Information Administration, *Mexico*.

<sup>28</sup> Comisión Nacional para el Ahorro de Energía

<sup>29</sup> Jan Hamrin, Meredith Wingate, and Laura Campbell. "The Potential for Using a Renewable Certificate System to Encourage Renewable Energy Development in Mexico: A Report to the North American Fund for Environmental Cooperation." June 2003. Internet online. Available from <<http://www.resourcesolutions.org/Library/librarypdfs/IntPolicy-NAFEC.pdf>> [March 5, 2004], 6.

combined-cycle turbines. However, given the high cost of natural gas and its recent price volatility, it is speculated that power from coal – even with its high emissions – and renewable sources could be favored more in the future.

### *2.3 Mexico's Air Emissions Challenges*

Mexico suffers from serious air pollution, especially in urban areas like Mexico City and Guadalajara. Regionally, Mexico's electric sector contributes over 50 percent of regional SO<sub>2</sub> emissions and more than 20 percent of regional NO<sub>x</sub> emissions.<sup>30</sup> This has resulted in modest regulation of power plant air emissions of SO<sub>2</sub> and NO<sub>x</sub>.

Mexico contributes about 1.5 percent of global energy-related carbon emissions<sup>31</sup> and nearly 40 percent of its total national CO<sub>2</sub> emissions come from electricity generation.<sup>32</sup> Due to its reliance on fossil generation, Mexico is a large contributor of greenhouse gas emissions in Latin America, with a high carbon intensity rate relative to other Central and South American countries.

To address climate change, Mexico has ratified the Kyoto Protocol. However, as a developing country, it does not have an emissions reduction obligation under the treaty. Yet through the Kyoto Protocol's Clean Development Mechanism (CDM), Mexico is permitted to host certain types of projects that will contribute to global greenhouse gas reduction. Depending on the project, the activity may also generate local co-benefits, like reduced local air pollution, sustainable land management or habitat restoration.

### *2.4 Electricity Sector Reform*

Mexican President Vicente Fox is a strong proponent of the private sector's involvement in the energy sector. The Fox Administration views deregulation of the electricity sector as an important vehicle to attain Mexico's energy expansion goals. However, Fox's energy sector reforms have stalled due to opposition from the Mexican Congress. Further, in 2002, the Mexican Supreme Court challenged an Executive Order that Fox issued in 2001 that permitted private generators to sell excess power to the state-owned utilities. The Court cited constitutional conflicts. Fox has since tried to work with Mexican Congress to amend the Constitution on this point. This issue is still pending; it is unlikely that Mexican electricity markets will open further during his term.<sup>33</sup>

Despite these political and constitutional disputes, independent power producers can participate in the energy sector on a limited basis. For example, the government released a new rule in September 2001 that permits contracts between CFE and "self-generators." Under this rule, self-suppliers can generate and consume power at distinct locations, enabling generators to contract with industrial and municipal end-users and supply power to them at lower rates than the government utilities. While the self-generator rule has resulted in new wind development in Mexico, in practice, these deal structures incur high transaction costs, are inefficient to execute and will not provide a sustainable market for renewable power in Mexico.<sup>34</sup>

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<sup>30</sup> North American Commission for Environmental Cooperation, "Background Paper," 4.

<sup>31</sup> Energy Information Administration, "Mexico."

<sup>32</sup> North American Commission for Environmental Cooperation, "Background Paper," 4.

<sup>33</sup> World Bank Group. "Mexico: Large-Scale Renewable Energy Project Development. A Global Environment Facility Project Brief." February 2003. Internet online. Available from <[http://gefweb.org/Documents/Council\\_Documents/GEF\\_C21/CC\\_-\\_Mexico\\_-\\_Project\\_Document.pdf](http://gefweb.org/Documents/Council_Documents/GEF_C21/CC_-_Mexico_-_Project_Document.pdf)> [March 15, 2004], 10.

<sup>34</sup> Hamrin, Wingate, and Campbell, 7.



## *2.5 Mexico's Renewable Energy Potential*

Given Mexico's large fossil fuel reserves and its emphasis on "least-cost"<sup>35</sup> energy procurement, national renewable energy potential has only recently been explored. Significant resource potential has been identified, spanning a range of sources that includes wind, hydropower, geothermal, solar and biomass.

Wind energy potential in Mexico is quite substantial and is the most economically competitive renewable resource. New wind facilities are estimated to be able to generate power at 1.5 to 2.0 cents more per kWh as compared to new combined-cycle natural gas plants.<sup>36</sup> Estimates of wind generation potential from high quality sites range from 3,000 MW to 5,000 MW. Some experts estimate 5,000 MW of wind potential in Oaxaca, Baja California and Yucatan, with 1.6 MW to 54 MW currently planned in Oaxaca.<sup>37</sup> Attractive sites have also been identified in Tehuantepec, in the central and northern regions and along the coast.

Several high quality sites, particularly in southwest Mexico, are located in rural areas. Beyond the benefits of expanded electricity generation, developing this capacity would bring needed economic opportunities through job creation and revenue from wind farms and land leases.<sup>38</sup>

Estimates of renewable energy potential are also strong in the following areas:

- Hydro – According the CFE, Mexico's hydro potential is estimated at 43,000 MW, distributed across the country at 500 sites. Small hydro capacity (less than five MW) is estimated at about 3,200 MW. However, potential capacity figures do not reflect actual generation capacity due to fluctuating water supplies.
- Geothermal – Since Mexico is in a volcanic region, it has significant geothermal potential. In 1999, Mexico's geothermal generation was third in the world at 5,623 GWh. Potential capacity is estimated to be over 35,000 MW and CFE has proposed developing 123 MW over the next decade.<sup>39</sup>
- Biomass – The Mexican government estimates that there is 1,000 MW of generation potential from sugar cane biomass and about 150 MW possible from landfills.<sup>40</sup>
- Solar – Nearly three-quarters of the country is considered arid or semi-arid with an average solar radiation of five kilowatt hours per square meter per day.<sup>41,42</sup>

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<sup>35</sup> Mexico's Constitution requires that electricity be procured on a least-cost basis. This has been viewed by CFE and others under narrow and largely financial terms. Please see the barriers to renewable energy generation section for more information on this policy.

<sup>36</sup> Hamrin, Wingate, and Campbell, v. This takes into account Mexico's least-cost definition.

<sup>37</sup> Hamrin, Wingate, and Campbell, 3.

<sup>38</sup> World Bank Group, 6. Programa Energía y Medio Ambiente hacia el Desarrollo Sustentable. 2003. SENER-SEMARNAT 2002-2003.

<sup>39</sup> Hamrin, Wingate, and Campbell, 7. Programa Energía y Medio Ambiente hacia el Desarrollo Sustentable. 2003. SENER-SEMARNAT 2002-2003.

<sup>40</sup> Instituto Nacional de Ecología/SEMARNAT. "E-mail on renewable energy in Mexico." March 2004.

<sup>41</sup> Instituto Nacional de Ecología/SEMARNAT.

<sup>42</sup> de Buen, 2.

### **Planned Renewable Energy Projects in Mexico**

#### **CFE (~1,773 MW)**

- Hydro power stations: Chicoacen, Chiapas (936 MW), El Cajón, Nayarit (680 MW)
- Geothermal: Los Azufres, Michoacán (107 MW)
- Wind energy: La Ventosa, Oaxaca (100 MW)

#### **Independent Power Producers (~178 MW)**

- Wind energy: La Ventosa, Oaxaca (107 MW), Santa Catarina, Nuevo León (10 MW)
- Biomass Energy: Tizayuca, Hidalgo (15 MW), Monterrey, Nuevo León (7.4 MW)
- Solar Energy: Baja California (39 MW)

Source: Las energías renovables en el marco de una política energética sustentable. Presentación del Dr. Barnés de Castro, Agosto 22, 2002 provided by El Instituto Nacional de Ecología/SEMARNAT, March 2004

## *2.6 Barriers to Renewable Energy Generation*

The primary barriers to increased renewable energy generation stem from the Mexican Constitution. The Constitution requires the procurement of power on a “least-cost” basis. This has been interpreted narrowly by CFE to focus on financial costs. As renewable power tends to be more expensive than other sources of generation in the country, it cannot compete. The World Bank, through the Global Environment Facility Large-Scale Renewable Energy Development Project, is working with the Mexican government to broaden the interpretation of least-cost procurement to include factors like fuel price risk and environmental externalities.<sup>43</sup> By doing so, renewable energy, and especially wind generation, would be more competitive.

In addition, the Mexican Constitution limits private sector investment to the sector. This has been modified through reforms that permit Independent Power Producers (IPP) to respond to bid solicitations by CFE and to enter into power purchase agreements with customers under the guise of “self-generator” status. IPPs can also sell electricity to off-takers, usually large groups of consumers or industrial firms. While a step in the right direction, these reforms do not provide a stable climate to attract significant investment in renewables.

For robust renewable energy development in Mexico, market structures should enable direct sales from IPPs to the utilities and end-users under long-term contracts.<sup>44</sup> Long-term contracts of at least ten years provide certainty to energy investors. Further, policies should be adopted to level the playing field with Mexico’s traditional generation sources, including the elimination of subsidies for fossil fuels and the creation of incentives for renewable energy generation.<sup>45</sup>

## *2.7 Financial Benefits of Market-Based Programs*

Mexico could gain from bilateral or regional market-based programs, depending on their structure. The greatest potential benefits stem from revenue that could be generated under greenhouse gas credit

<sup>43</sup> For more information on the World Bank/Global Environment Facility Renewable Energy Strategic Partnership, please see [http://gefweb.org/Documents/Council\\_Documents/GEF\\_C21/CC\\_-\\_Mexico\\_-\\_Project\\_Document.pdf](http://gefweb.org/Documents/Council_Documents/GEF_C21/CC_-_Mexico_-_Project_Document.pdf).

<sup>44</sup> Hamrin, Wingate, and Campbell, 12.

<sup>45</sup> de Buen, 5.

trading or renewable energy certificate (REC) trading. This revenue will help finance power plants and an energy infrastructure crucial to meeting Mexico's energy needs. It can also spur economic development through domestic equipment manufacturing and job creation to support the industry.

Similar to its role under the US Joint Implementation Program and the CDM, Mexico could serve as the host for projects that generate renewable energy and greenhouse gas emissions benefits. Under market-based programs, the environmental attributes of these activities could be quantified, verified and then purchased for use under voluntary trading or regulatory compliance outside of Mexico.

Under greenhouse gas programs, a greenhouse gas credit is usually measured as one metric ton of carbon dioxide equivalent (CO<sub>2</sub>e). While these trading markets are in their infancy, demand for verified greenhouse gas reduction credits under the CDM, Certified Emission Reductions (CERs), are increasing. Currently, 2005-2008 vintage CERs are priced from \$3.00 to \$6.00/CO<sub>2</sub>e.<sup>46</sup> Since the US and Canada have rising greenhouse gas emissions, bilateral or regional credit trading programs might support similar or even higher prices.

Under RECs trading, a certificate is equal to the environmental attributes derived from a unit of electricity generated by renewable energy as compared to the electricity source it is displacing – often measured on a per megawatt-hour basis. Prices for RECs in the US vary widely. Currently, they range from \$3.50 to as much as \$150 depending on several factors, including:

- the source of renewable energy generation (e.g., wind, solar, geothermal or biomass);
- whether the certificates are being used for compliance or voluntary trading purposes; and
- whether the REC has been generated from new or existing facilities.<sup>47</sup>

In both of these evolving environmental markets, buyer preference can also influence prices for environmental commodities. This is especially prevalent in the voluntary markets. For example, a buyer may be willing to pay a premium for a greenhouse gas reduction credit if it is generated by renewable energy or from a specific geographic area where they have a commercial or philanthropic interest. In voluntary RECs markets, some buyers may be willing to pay a premium for certificates generated from new renewable energy facilities.

Looking at the existing greenhouse gas and RECs market prices, the potential financial benefits for Mexico would likely be greatest under mandatory, market-based programs. Mandatory programs usually impact a larger pool of participants, creating stronger demand that drives price. Further, mandatory programs usually impose financial penalties for non-compliance, which also influences price. For example, it is expected that prices for CERs will rise should the Kyoto Protocol enter into force.<sup>48</sup> However, given the emphasis in the US on voluntary greenhouse gas reduction initiatives and the existing demand for voluntary RECs in the region, price signals from voluntary programs could prove valuable.

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<sup>46</sup> Evolution Markets, Inc. "Weekly e-mail on the GHG Market Update." March 22, 2004. Since the Kyoto Protocol has not been ratified, the projects and the potential CERs that can be generated have several risks associated with them, including counter-party risk, price risk, and project approval risk, among others. These risks decrease the price.

<sup>47</sup> Evolution Markets, Inc. "Renewable Energy Certificate Market." Internet online. Available from <[http://www.evomarkets.com/assets/mmu/mmu\\_rec\\_feb\\_04.pdf](http://www.evomarkets.com/assets/mmu/mmu_rec_feb_04.pdf)> [March 25, 2004] and "Voluntary Renewable Energy Certificate Market." Internet online. Available from <[http://www.evomarkets.com/assets/mmu/mmu\\_vrec\\_feb\\_04.pdf](http://www.evomarkets.com/assets/mmu/mmu_vrec_feb_04.pdf)> [March 25, 2004].

<sup>48</sup> Benedikt von Butler. "Interview." Evolution Markets, Inc. March 26, 2004.

## *2.8 Quantifying Environmental Benefits from the Electric Sector*

As Mexico's current energy expansion strategy relies heavily on natural gas, the greenhouse gas emissions intensity of its generation mix is expected to improve. A bilateral or regional greenhouse gas emissions credit trading program, with links to the US in particular, could generate revenue to support its power development from the value created from carbon benefits.

Mexico's energy plan offers a range of opportunities to generate CO<sub>2</sub>e credits, depending on how its emissions baseline is set under a trading or crediting program. If a historical baseline is adopted, the lower carbon content of natural gas and renewable energy as compared to oil, and the efficiency of combined-cycle technology, will yield credits. Alternatively, if natural gas combined-cycle technology is the base, strong incentives are provided for renewable energy investments.

Similarly, should RECs generated in Mexico be eligible under voluntary or mandatory renewable energy certificate trading programs in the US or Canada, Mexico could receive additional funds for its power development.

## *2.9 Additional Benefits of Market-Based Programs*

Market-based programs that increase the use of clean energy technologies could provide other important benefits to Mexico. New renewable energy power development would increase, diversify and improve the reliability of the domestic supply. This would also free up domestic fuel sources for export, which could be economically advantageous as prices of oil and natural gas rise.<sup>49</sup> Further, since some very attractive sites for development are in rural areas, underserved communities are more likely to be electrified.

From an environmental perspective, greater use of clean energy technologies reduces local and global air pollution. Health risks from pollution impact the quality of life of Mexico's citizens and the health of plant life. Also, the increased use of renewable energy sources could reduce degradation of waters due to power plant cooling and the extraction of fossil fuels. Land disturbances from the mining of fossil fuels, oil and gas drilling and the impacts of large-scale hydropower would also be minimized.<sup>50</sup> Finally, clean energy technologies can enhance Mexico's energy security. Renewable energy and energy efficiency reduce Mexico's dependence on foreign sources of fuel. Greater efficiency diminishes the amount of fuel needed to deliver the same services, and renewable energy decreases the demand for foreign fuel.<sup>51</sup> Section 3 discusses several emerging and established market-based programs in the region aimed at reducing emissions and increasing renewable energy generation.

## **3. Experiences with Market-Based Programs**

A key to a cleaner energy development path for all three nations involves transparent, coordinated and consistent environmental management. Even with differing regulatory foundations and resource capacity, significant progress can be made by using market-based approaches to attain shared

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<sup>49</sup> Increasing Mexico's fossil fuel exports will not improve the global environment through the reduction of greenhouse gas emissions if the fuel is combusted by the importing country.

<sup>50</sup> William R. Moomaw. "Assessing Barriers and Opportunities for Renewable Energy in North America: Background Paper for the Council under Articles 13 of the North American Agreement for Environmental Cooperation." June 2002. Internet online. Available from <[http://www.cec.org/files/PDF/moomawfinal-e4-fin\\_en.pdf](http://www.cec.org/files/PDF/moomawfinal-e4-fin_en.pdf)> [February 15, 2004], Executive Summary.

<sup>51</sup> Econergy International Corporation. "Renewable Energy and Energy Efficiency in Mexico: Barriers and Opportunities." September 28, 2000, 4.

objectives. National regulatory agencies working bilaterally and in partnership with regional institutions like the CEC can help build the infrastructure to coordinate policies to protect the environment and expand clean energy markets.

This section provides a brief overview of a select group of market-based programs that may serve as models to expand clean energy markets and reduce greenhouse gas emissions in North America.

### *3.1 Greenhouse Gas Programs*

Since greenhouse gas emissions have a global impact, reduction activities inside and outside national and regional borders have the same positive environmental effect. This provides a strong rationale for regional and global market-based programs that facilitate emission reduction at the lowest cost to society.

Emissions trading and credit trading are being considered by all three countries to reduce emissions. Canada and Mexico are preparing to participate in the Kyoto Protocol's market-based mechanisms. This requires setting up the domestic institutional framework to track and transfer emissions allowances and credits. Canada is working in consultation with large emitters in the country to develop a national greenhouse gas emissions trading regime. In January 2004, Mexico announced the launch of a national office to review CDM projects.<sup>52</sup> In the US, voluntary emissions trading is continuing, and several states are looking at market mechanisms as a way to meet their voluntary and, in some cases mandated, emissions reduction targets.

The diversity among these activities is important to note. A key characteristic is whether these activities are voluntary or mandated by the government. In the US, the federal government supports voluntary measures to reduce emissions. In February 2002, President Bush released a national global climate change plan that includes an 18 percent reduction in greenhouse gas intensity over a ten-year period. Under the plan, intensity is measured in metric tons of emissions per million dollars of GDP. The President also expressed the Administration's support for market-based approaches to help reduce emissions and called for the development of a national greenhouse gas registry as well as recommendations on providing transferable credits for valid emission reductions.<sup>53</sup>

Several states in the US have taken action to reduce greenhouse gas emissions. The states of Massachusetts, New Hampshire, Oregon and Washington have established laws or regulations that require CO<sub>2</sub> emission reductions or offsets from power plants. Under these programs, market-based mechanisms such as credit trading are allowed. Regional blocks have been formed in the Northeast and West Coast to look at emissions trading as a means of reaching voluntary greenhouse gas reduction targets. This mix of voluntary and mandatory market-based approaches makes consistency and transparency among programs a challenge, but also provides more opportunities and flexibility to experiment with different types of market-based activities on a regional basis.

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<sup>52</sup> Point Carbon. "CDM Monitor Newsletter." January 15, 2004. Internet online. Available from <[http://www.pointcarbon.com/wimages/CDM\\_Monitor\\_14\\_Jan-uary\\_2004\\_updated.pdf](http://www.pointcarbon.com/wimages/CDM_Monitor_14_Jan-uary_2004_updated.pdf)> [January 14, 2004].

<sup>53</sup> Statement issued by U.S. President George W. Bush. "Fact Sheet: President Bush Announces Clear Skies & Global Climate Change Initiatives." February 14, 2002. Internet online. Available from <<http://www.whitehouse.gov/news/releases/2002/02/20020214.html>> [March 5, 2004]

### *3.2 Examples of Emissions Trading Programs*

#### Canada's Greenhouse Gas Emissions Trading Program

In order to meet its Kyoto Protocol target in an efficient and cost effective manner, Canada is developing a domestic greenhouse gas emissions trading program. Canada's Climate Change Plan requires large industrial emitters of greenhouse gases in the country – mostly from the electricity, oil and gas, mining and manufacturing sectors – to reduce their emissions by 55 megatonnes (Mt) during the first commitment period of the Kyoto Protocol (2008-2012). This corresponds to roughly a 15 percent reduction by all covered sources. The proposed program allocates allowances to covered sources on an output-basis (i.e., emissions per unit of output). This is significant, as it rewards clean energy technologies, such as renewable energy and energy efficiency, through the allocation process.

The program also includes a safety valve that allows sources to purchase allowances from the government at a fixed price should market prices rise. The price of these government-issued allowances is expected to be \$15(Can) per ton of CO<sub>2</sub>e. A drawback to including a safety valve in the emissions trading program is that it does not ensure a defined emission reduction level. A firm cap on emissions would provide more certainty on actual emissions.

Emissions allowances will likely be allocated to large emitters at no cost to 85 percent of their forecasted emissions in 2010. If these entities require additional permits to cover their emissions, they will be able to purchase allowances and emissions offsets under the trading program. They will also be able to sell and bank surplus allowances.

The federal government of Canada has been working with industry and a range of stakeholders on the design of the emissions trading program through the Canadian Working Group on the Carbon Market. The Working Group released a statement of principles in October 2003 that calls for the domestic trading program to be linked with other trading programs under the Kyoto Protocol.<sup>54</sup> According to the working group, this is important to ensure flexibility and lower cost compliance. The principles do not mention linkage with non-Kyoto Protocol trading programs. However, in the abstract, trading with US entities would provide a wider pool of participants and could be consistent with their program design goals. While the specific elements of an environmentally credible emissions trading program are beyond the scope of this paper, consistent and transparent reporting, accounting and verification systems are essential foundations for trading – yet they do not exist between the US, Canada and Mexico today.<sup>55</sup>

#### Chicago Climate Exchange

The Chicago Climate Exchange (CCX) is a voluntary greenhouse gas trading pilot project that establishes an emissions trading and credit trading program in North America. Initially, participation in the Exchange was limited to facilities located in the Midwest US, with credit trading permitted with Brazil. However, Canadian and Mexican entities can now join.

There are more than 25 members of the Exchange, including IBM, Ford Motor Company, Dupont, International Paper, American Electric Power and the Bayer Corporation. Universities and other organizations are also permitted to join.

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<sup>54</sup> Natural Resources Canada. "Principles for the Canadian Carbon Market." October 23, 2003. Internet online. Available from <[http://www.nrcan-rncan.gc.ca/lfeg-ggef/English/principles\\_en.pdf](http://www.nrcan-rncan.gc.ca/lfeg-ggef/English/principles_en.pdf)> [March 26, 2004].

<sup>55</sup> For a thorough discussion of the design issues related to emissions trading, please see Doug Russell's paper.

Participation in the Exchange requires adopting a legally-binding absolute emission reduction target, equal to a four percent reduction in emissions by 2006, using a 1998-2001 baseline. Participants also agree to report their facility-level emissions and are allocated allowances based on their historical average annual emissions during 1998-2001. A portion of the allowances are held back by the CCX and are available for purchase via periodic auctions. If a member of the Exchange does not have sufficient allowances to cover their emissions, they are able to purchase emissions allowances or credits generated by eligible project activities through the Exchange.

The Exchange was officially launched in September 2003 with its first auction. Allowance prices during the auction ranged from \$0.60 cents to \$2.90 per metric ton of CO<sub>2</sub>.<sup>56</sup> The exchange is now open for continuous trading through 2006. Monthly figures show trading volume increasing and allowance prices ranging in price from \$0.84 cents to \$0.94 cents per metric ton of CO<sub>2</sub>.<sup>57</sup>

### Massachusetts Power Plant Emission Regulation

Massachusetts was one of the first states in the US to formally establish limits on greenhouse gas emissions. Six large-scale power plants generate about 40 percent of total electricity in the state, but emit 90 percent of all greenhouse gases from the electricity sector.<sup>58</sup> Under a restructuring initiative passed in 2001, the state requires each plant to reduce CO<sub>2</sub> by ten percent by the middle of this decade (from 1997 to 1999 average CO<sub>2</sub> levels). The law does not mandate a method for achieving these reductions. Plants are allowed to secure credits through verifiable off-site reductions, including renewable energy generation. Regulations to permit emissions trading are under development.<sup>59</sup>

### *3.3 Examples of Credit Trading Programs*

#### Oregon Climate Trust

In 1997, Oregon was the first state in the US to adopt legislation regulating CO<sub>2</sub> from power plants. House Bill 3283 established a CO<sub>2</sub> emissions standard of .675 pounds of CO<sub>2</sub> per kWh for all new or expanded power plants in the state. This corresponds to about a 17 percent reduction in plant emissions, based on best practices in the US.

Plant developers can choose to use emissions credits or offsets<sup>60</sup> to meet the standard or to pay into the Oregon Climate Trust. The Trust is a non-profit organization charged with procuring offsets under the program at a defined rate per ton of CO<sub>2</sub>e.<sup>61</sup> Eligible projects categories include landfill gas recovery, renewable energy, energy efficiency and carbon sequestration.

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<sup>56</sup> Doran, James. "Landmark Emissions Exchange Launched in Chicago." In the London Times. October 01, 2003. Internet online. Available from <<http://www.timesonline.co.uk/printFriendly/0,,1-5-837369,00.html>> [March 5, 2004].

<sup>57</sup> Chicago Climate Exchange. "Chicago Climate Exchange Announces Record February 2004 Trading Results." Internet online. Available from <<http://www.chicagoclimateexchange.com/news/pdf/CCXPressRelease040302.pdf>> [March 15, 2004].

<sup>58</sup> Rabe, Barry G. "Greenhouse and Statehouse: The Evolving State Government Role in Climate Change." November 2002. The Pew Center. Internet online. Available from <<http://www.pewclimate.org/docUploads/states%5Fgreenhouse%2Epdf>> [March 15, 2004], 16.

<sup>59</sup> Weber, Sharon. "Power Point Presentation on Massachusetts Multi-pollutant Power Plant Regulations." EPA Utility MACT Working Group. March 4, 2003. Internet online. Available from <[www.epa.gov/ttn/atw/combust/tiltox/masshg.ppt](http://www.epa.gov/ttn/atw/combust/tiltox/masshg.ppt)> [March 26, 2004].

<sup>60</sup> According to the Oregon Climate Trust, a greenhouse gas offset is a project implemented specifically to reduce the level of greenhouse gases in the atmosphere. They are called "offsets" because the greenhouse gas reductions do not occur at the purchaser's site, but rather they are implemented by a separate organization at another site. <<http://www.climatestrust.org/whatisanoffset.html>> [March 8, 2004].

<sup>61</sup> The Climate Trust. "House Bill 3283." Internet online. Available from <<http://www.climatestrust.org/>>

Similar to other crediting programs, projects must demonstrate that they would not have occurred without the funding of the offset purchaser.<sup>62</sup> Second, the results must be rigorously quantified. A future baseline must be developed, and actual emissions must be measured and then verified by an independent third party. The difference between the baseline and the actual emissions represents the greenhouse gas benefit generated by the project.

The Trust is mandated to use at least 80 percent of its revenue for the direct purchase of carbon offsets. In the initial phase, the Trust was able to purchase offsets at \$1.50 per metric ton of CO<sub>2</sub>e, offsetting about 844,000 metric tons over the next ten to 100 years.<sup>63</sup>

The Trust was established to provide certainty on the cost of offsets and to keep the cost of compliance low. This feature dampens the price signal that could have been created under the program because it does not fully internalize the costs of meeting the standard. The pay in lieu of offsets approach shields developers from the market price, which would likely be higher. From an environmental perspective, paying into the fund could be problematic, as it does not guarantee an absolute emission reduction level. Despite these issues, the Oregon program has received wide support and in early 2004 the state of Washington adopted a similar program.<sup>64</sup>

#### Clean Development Mechanism

Article 12 of the Kyoto Protocol permits greenhouse gas credit trading between countries with emission reduction obligations under the treaty and developing countries that do not have emission reduction obligations under the treaty. The CDM has two founding objectives:

- to enable Parties to the agreement to meet their emission reduction commitments; and
- to enable developing countries to achieve their sustainable development goals.

Following the rules for the CDM established under the Marrakech Accords,<sup>65</sup> an international Executive Board was created to develop the project approval and certification procedures for the CDM. The CDM Executive Board oversees the CDM's operations, registers CDM projects and approves project baselines, monitoring and verification rules.

Like the Oregon Climate Trust, projects must submit detailed project applications, including a baseline and monitoring and verification plans. Project additionality must also be demonstrated. In addition, to ensure that the project contributes to local sustainable development, the host country must approve the CDM activity.

Even though the Protocol has not entered into force, eligible CDM projects are permitted to generate credits, or CERs, starting in 2000. Small-scale projects and renewable energy and energy efficiency projects are able to use streamlined procedures in an effort to lower transaction costs and increase technology transfer and deployment.

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housebill.html> [March 5, 2004]. House Bill 3283 set the price at \$0.57 per short ton of CO<sub>2</sub>. The price changed to \$0.86 per short ton in 2001. This converts to \$0.96 per metric ton of CO<sub>2</sub>.

<sup>62</sup> This is often referred to as the project additionality test.

<sup>63</sup> The Pew Center. "State and Local Net Greenhouse Gas Emissions Reduction Programs" Internet online. Available from < <http://www.pewclimate.org/states.cfm?ID=17> > [March 5, 2004].

<sup>64</sup> The Business Council for Sustainable Energy. "Energy at the State Level." March 2004, 26.

<sup>65</sup> The Marrakech Accords were adopted at the Seventh Conference of the Parties to the United Nations Framework Convention on Climate Change, held in November 2001 in Marrakech, Morocco. For more information, please see [www.unfccc.int](http://www.unfccc.int).



### 3.4 Bilateral Initiatives

#### Northeast Climate Change Action Plan

In August 2001, the Conference of New England Governors and Eastern Canadian Premiers announced a comprehensive Climate Change Action Plan. The plan adopts multiple goals for the cross-border region to reduce greenhouse gas emissions and expand clean energy markets. Of particular relevance is the plan's voluntary goal to reduce greenhouse gas emissions. Short-, mid- and long-term targets were established.

The Conference is comprised of the governors of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont and the premiers of New Brunswick, Newfoundland and Labrador, Nova Scotia, Prince Edward Island and Québec. The Conference meets annually to discuss issues of common interest and cooperates on workshops and studies. The Conference has directed its Committee on Environment to execute a work plan to help meet its regional greenhouse gas targets.

| <b>New England Governors and Eastern Canadian Premiers Climate Action Plan</b><br><i>Voluntary Greenhouse Gas Targets</i> |   |
|---|---|
| Short-term Goal:  | Reduce regional GHG emissions to 1990 emissions by 2010   |
| Mid-term Goal:  | Reduce regional GHG emissions by at least 10 percent below 1990 emissions by 2020, and establish an interactive five-year process, commencing in 2005, to adjust the goals if necessary and set future emissions reduction goals. |
| Long-term Goal:   | Reduce regional GHG emissions sufficiently to eliminate any dangerous threat to the climate; current science suggests this will require reductions of 75 to 85 percent below current levels                                       |

Key elements of the plan are a regional inventory protocol, emissions registry and trading scheme. In addition, these programs will likely be compatible with other plans promoted by members of the Northeast States for Coordinated Air Use Management (NESCAUM) such as New York.

The details of the emissions trading program are under consideration.<sup>66</sup> Key issues including the sectors and sources covered under the program, the allocation method and the verification rules have yet to be decided. Given that the Conference's implementation strategy is still in the design phase, it is difficult to assess its merits as a model for North American expansion. However, due to its cross-border scope, it is widely praised and has the potential to reduce emissions and expand clean energy markets in the Northeast region.

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<sup>66</sup> The New England Governors' Conference. "The 28th Annual Conference of the New England Governors and the Eastern Canadian Premiers: Resolution & Reports." September 7 - 9, 2003. <[http://www.negc.org/03resolutions/res28\\_7.html](http://www.negc.org/03resolutions/res28_7.html)> [March 5, 2004].

### *3.5 Regional Efforts*

#### The North American Commission for Environmental Cooperation

The CEC is an international organization that was established by the environmental side agreements to NAFTA. Its mission is to facilitate environmental cooperation between NAFTA partners – Canada, Mexico and the US. Through the Pollutants and Public Health program, it focuses on air quality cooperative efforts, including a project on North American air pollutant and greenhouse gas emissions inventories.<sup>67</sup> Its Environment, Economy and Trade program is exploring how market-based mechanisms can be utilized in North America to spur renewable energy development.<sup>68</sup>

The CEC is not a policymaking body. Its mandate and work plans are directed by the Party governments to NAFTA. Depending on the issue area, the CEC has been given more latitude to facilitate regional policymaking. For example, its work on renewable energy, which commands considerable support from CEC member governments, is quite advanced. The CEC is supporting efforts to:

- analyze renewable energy potential in North America;
- assess policies and market-based approaches to accelerate increased renewable energy generation; and
- develop a North American renewable energy certificate accounting platform.

In more politically sensitive areas, like climate change, the CEC is serving a technical role. It has sponsored studies on the design of regional greenhouse gas registries and the legal questions surrounding regional greenhouse gas trading programs. However, since the US withdrew from the Kyoto Protocol in 2001, the CEC has shifted its focus on North American emissions trading to the traditional air pollutants — SO<sub>2</sub> and NO<sub>x</sub> — where more regional consensus exists.

Because the CEC is a regional body focusing on electricity, trade and the environment, it could be well positioned to advance and facilitate the adoption of market-based approaches to address climate change. However, since it is consensus-driven and does not have decision-making authority, its capacity in this area is likely limited in the near future.

### *3.6 Renewable Energy Certificate Trading*

Renewable energy certificate trading facilitates the transfer of commodities that represent the environmental attributes of renewable power generation. RECs are most commonly associated with an RPS, which sets a target and timetable for increased generation of renewable energy.

Fourteen states in the US and the Province of Québec have adopted some form of RPS requirement. At least seven US RPS programs permit RECs trading. Generally, RPS programs vary in several areas:

- what qualifies as renewable energy;
- whether renewable energy or RECs must be generated within the state or province;

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<sup>67</sup> For more information on the CEC's greenhouse gas related work, please see, [http://www.cec.org/programs\\_projects/pollutants\\_health/project/index.cfm?projectID=22&varlan=english](http://www.cec.org/programs_projects/pollutants_health/project/index.cfm?projectID=22&varlan=english)

<sup>68</sup> Information on the CEC's renewable energy programs can be found at the following links: [http://www.cec.org/programs\\_projects/trade\\_enviro\\_econ/index.cfm?varlan=english](http://www.cec.org/programs_projects/trade_enviro_econ/index.cfm?varlan=english) and [http://www.cec.org/programs\\_projects/other\\_initiatives/electricity/index.cfm?varlan=english](http://www.cec.org/programs_projects/other_initiatives/electricity/index.cfm?varlan=english).

- whether RECs must be delivered with physical power;
- whether qualifying renewable power must be derived from new facilities; and
- whether RECs trading is permitted.

**Table 3 – States with Renewable Portfolio Standards**



Source: Union of Concerned Scientists.<sup>69</sup> This chart does not include Hawaii's voluntary RPS increase of 7% to 9% in 2010 that was adopted in 2003.

Voluntary RECs trading is also a driver for renewable power development in North America. Under voluntary models, companies, government entities, universities and other organizations commit to increase their usage of renewable power, often through the purchase of RECs. Motivations for voluntary RECs trading include environmental and civic responsibility, employee morale, public relations and reduced regulatory risk.<sup>70</sup>

Given the wide support for increased renewable energy development in North America, development of a regional RECs market might provide more near-term results than consideration of regional greenhouse gas emissions trading.<sup>71</sup> Further, the institutional framework required for a credible North American RECs market could lay the foundation for a regional trading program in the future.

At a minimum, the accounting system for a North American RECs program would require a transparent issuing, tracking and certification system. Presently, the CEC is participating in efforts to develop such as system with the Center for Resource Solutions (CRS), a nonprofit organization that

<sup>69</sup> Union of Concerned Scientists. "Clean Energy Fact Sheet: Renewable Energy Standards at Work in the States." Internet online. Available from <[http://www.ucsusa.org/clean\\_energy/renewable\\_energy/page.cfm?pageID=47](http://www.ucsusa.org/clean_energy/renewable_energy/page.cfm?pageID=47)> [March 4, 2004].

<sup>70</sup> Hamrin, Wingate, and Campbell, 16.

<sup>71</sup> Hamrin, Wingate, and Campbell, 4.

certifies RECs in the US. CRS has proposed the establishment of a North American Association of Issuing Bodies (NAAIB), which would set minimum standards for national or sub-national issuing bodies (envisioned to be independent transmission operators such as ERCOT and NEPOOL in the US) to issue, track, and retire RECs.<sup>72,73</sup>

The establishment of the NAAIB would not require agreement on a North American RPS; it would merely facilitate the transfer of RECs in the region. In addition, it would not dictate eligibility requirements for RECs. Local jurisdictions could retain their definitions of qualifying renewables as well as other RPS policies. A regional RECs accounting system would be beneficial to Mexico, as it would provide a transparent mechanism for the transfer of Mexican RECs to jurisdictions where they are permitted or for voluntary purposes.

### *3.7 Examples of RECs Programs*

#### Texas Renewable Energy Credit Program

Texas adopted an RPS as part of its electricity restructuring law in 1999. The program was adopted to:

- “ensure that new renewable energy capacity is built in the most efficient and economical manner;
- encourage the development, construction, and operation of new renewable energy resources at those sites in Texas that have the greatest economic potential for capture and development of environmentally beneficial resources;
- protect and enhance the quality of the environment in Texas through increased use of renewable resource; and
- respond to customers expressed preferences for renewable resources by ensuring that all customers have access to providers of energy generated by renewable energy resources.”<sup>74</sup>

The Texas RPS began in 2002; unlike many other RPS programs that mandate a minimum percentage of renewable energy generation, it requires 2,000 MW of new renewable energy capacity to be installed by 2009. This represents about three percent of generation capacity in the state. To meet the RPS, electricity providers have the option of developing the capacity internally or purchasing renewable energy credits. Eligible renewable energy sources must be located within the state of Texas and use hydropower, wind, solar, tidal, geothermal and landfill gas, among other renewable energy technologies. Credits can be banked for two years after issuance, and electricity providers are not required to purchase the physical power along with the credits.

The first compliance period ended in late 2002, when 400 MW of installed capacity was mandated. Due to the significant renewable resources in the state – mostly from wind energy – and tax credits available for renewable power development, more than 900 MWs of generation capacity was installed.

Even with its distinct rules, the Texas program has been praised because it: 1) establishes a strong target to drive new renewable energy development and economies of scale;<sup>75</sup> 2) places the requirement

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<sup>72</sup> For more information on the NAAIB, please see <http://www.resource-solutions.org/TRCAAIB.htm>

<sup>73</sup> Hamrin, Wingate, and Campbell, 31.

<sup>74</sup> Electric Reliability Council of Texas. “Renewable Energy Credit Program.” Internet online. Available from <<http://www.texasrenewables.com/recprogram.htm>> [March 15, 2004].

<sup>75</sup> Wisner, Ryan and Ole Langniss. “The Renewables Portfolio Standard in Texas: An Early Assessment.” November 13, 2001. Internet online. Available from <<http://www-library.lbl.gov/docs/LBNL/491/07/PDF/LBNL-49107.pdf>> [March 5, 2004].

on all electricity providers in the state; 3) permits credit trading; and 4) imposes a significant penalty for non-compliance.<sup>76</sup> The Texas RPS has been touted in Canada as a means to meet provincial commitments to increase renewables, and due to its proximity to Mexico, the Texas approach may be more easily expanded cross-border.<sup>77</sup>

#### Québec Renewable Portfolio Standard

In 2003, Québec adopted legislation requiring electricity providers<sup>78</sup> to acquire 1000 MW of new wind power capacity between 2006 and 2013. All of the wind power must be generated in Québec. The legislation also states that electricity providers must acquire 100 MW of energy produced from forest biomass every two years, beginning in 2005 and continuing until 2013.<sup>79</sup>

Québec's model offers a targeted RPS with no trading opportunities. However, as it is the first Canadian RPS, it shows the acceptance of this approach in Canada. With the favorable attention that the Texas RPS has received, other Canadian provinces such as Ontario are considering developing an RPS with a RECs trading program. Further, as with air quality issues and the greenhouse gas targets, Northeastern states and Eastern Canadian provinces are exploring cross-border RPS programs.<sup>80</sup>

For RECs trading to work on a regional basis, RPS policies must permit cross-border renewable energy generation to generate qualifying RECs. Presently, most RPS programs in North America – such as the two examples discussed in this section – do not permit RECs from outside their jurisdictions to be used for compliance purposes. However, voluntary RECs trading is more flexible and is driven by the preferences of the buyer, who may not restrict the geographic boundaries of RECs. Even with this significant barrier, regional RECs trading is receiving more attention by policymakers today than regional greenhouse gas trading. This is due to the regional interest in increased renewable energy generation.

## **4. Criteria for North American Market-Based Programs**

The design of market-based programs is crucial to their success in meeting environmental goals. Expanding existing programs regionally is challenging because it requires wider political support and regional institutions that can ensure accountability.

Criteria for regional market-based programs should include:

- strong and credible institutions;
- flexible program design;

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<sup>76</sup> Union of Concerned Scientists. "Clean Energy Fact Sheet: Renewable Energy Standards at Work in the States." Internet online. Available from

<[http://www.ucsusa.org/clean\\_energy/renewable\\_energy/page.cfm?pageID=47](http://www.ucsusa.org/clean_energy/renewable_energy/page.cfm?pageID=47)> [March 5, 2004].

<sup>77</sup> Eric Reguly. "Hey Dalton, Take a Tip from Texas." In *The Globe and Mail*. January 15, 2004. Internet online. Available from <<http://www.globeandmail.com/servlet/ArticleNews/TPStory/LAC/20040115/RREGULY15/TPColumnists/>> [March 15, 2004].

<sup>78</sup> Hydro Québec is the only electricity generator in the province.

<sup>79</sup> From CEC electricity database. Accessed March 18, 2004.

<http://www.cec.org/databases/certifications/Cecdata/main.cfm?CategorieID=7566&Varlan=english&WebSiteID=3>

<sup>80</sup> Notes from New York RPS Working Group meeting, May 7, 2003. Accessed on the Internet on March 18, 2004. [http://www.dps.state.ny.us/rps/NY\\_RPS\\_WG\\_4\\_meeting\\_minutes\\_050703.pdf](http://www.dps.state.ny.us/rps/NY_RPS_WG_4_meeting_minutes_050703.pdf)

- economic development and energy development plans;
- broad-based political support at national and local levels; and
- use of existing regional frameworks.

#### *4.1 Credible Institutions*

At a minimum, workable regional market-based programs will require the establishment of strong and transparent institutions that issue, track and verify environmental commodity transfers. This includes consistent reporting and verification protocols. Many of the greenhouse gas and RECs trading programs mentioned in Section 3 contribute to the understanding and development of this vital foundation.

Specifically, the creation of an NAAIB (or similar organization) would help build a credible accounting system for regional RECs trading. In the climate change arena, the CCX has a fairly advanced greenhouse accounting platform that, like other emerging greenhouse gas registries in North America, could influence the development of a regional greenhouse gas emissions trading program.<sup>81</sup>

#### *4.2 Flexible Program Design*

Given the early stage of development of many market-based programs, a regional initiative should lay a sound foundation and serve as a testing ground for different policy options. Regional market-based programs should be able to respond to the evolving policy interests of the three governments without sacrificing program integrity. The NAAIB proposal exemplifies a flexible approach. A RECs accounting system such as that of the NAAIB could also be expanded to encompass additional environmental commodities – including CO<sub>2</sub> emissions trading – in the future.

The design of the CCX trading program would likely be hard to expand beyond a voluntary pilot. Political issues such as: 1) whether, and at what level, an emissions cap is set; and 2) how allowances are allocated, impact economic competitiveness. These issues would be challenging to resolve regionally.

#### *4.3 Economic Development and Energy Development Plans*

Strategic assessment of economic development and energy goals at national and regional levels are important prerequisites for regional market-based programs. This is especially important for developing countries, whose resources may be more limited.

#### *4.4 Broad-Based Political Support*

Domestic support is a crucial factor for approval of regional environmental initiatives. For example, the bilateral progress that has been achieved over the past decade to reduce air pollution and smog under the Canada-US Air Quality Agreement was the result of strong domestic support for action in the affected jurisdictions. At the time of the agreement's signing in 1991, the two nations had approved mandatory reduction of air emissions. The agreement focused on maximizing efficient management of air emissions through cross-border cooperation – it did not establish new targets and timetables for emission reductions.

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<sup>81</sup> The California Climate Action Registry, the US Department of Energy and the federal government of Canada are developing greenhouse gas registries and reporting requirements.

The lack of regional consensus on a climate change strategy is a primary inhibitor to the development of North American market-based mechanisms in this area. Further, the issue of climate change has become politicized, making even incremental regional efforts such as the development of a regional greenhouse gas registry a challenge.

Regional RECs trading is more of an open topic. The US has the most experience with RECs in the region. Canada and Mexico are supportive of regional cooperation on RECs due to the multiple benefits associated with increased renewable energy generation. Market-based approaches that lower the price of renewable energy technologies and help create domestic economies of scale are attractive, as long as they do not mandate a one-size-fits-all approach.

#### *4.5 Use of Existing Regional Frameworks*

The CEC and the Conference of Northeastern Governors and Eastern Canadian Primers offer existing and constructive frameworks to cooperate on regional environmental issues. The CEC is a young organization, with varying degrees of latitude to shape policy. On climate change, the CEC is constrained due to the political and policy differences of the NAFTA partners. In contrast, on renewable energy policy, the CEC is facilitating the development of valuable regional market-based programs. The Conference of Northeastern Governors and Eastern Canadian Primers, like the CEC, does not have a strong policymaking mandate. However, with the release of its Climate Action Plan, political leaders in the region have articulated a strong commitment to emissions reduction and market-based programs.

Bilateral efforts like the US-Mexico Air Quality Agreement could provide vehicles to consider a cross-border RECs program and greenhouse gas crediting and trading programs. However, for now, the political leaders are more comfortable addressing market-based mechanisms aimed at traditional air pollutants.

## **5. Conclusions and Recommendations**

Given the increasing integration of North American energy markets and the expected rise in energy demand over the next several decades, it is critical that regional approaches are considered to encourage new clean energy generation and greenhouse gas emissions management.

Market-based initiatives that provide a financial value for improved environmental performance could assist all three countries in meeting their common environmental goals. For Mexico, a developing economy, this is especially important. Mexico is expected to require \$50 billion in energy sector investment over the next ten years to meet its growing electricity needs. It also suffers from serious air pollution, especially in urban areas such as Mexico City and Guadalajara.

Though Mexico has large renewable energy resources, it is mainly an oil and natural gas producer and exporter. As part of its ten-year national energy strategy, Mexico is planning to decrease its oil-based generation and dramatically increase its clean energy generation, with natural gas. This strategy offers a range of opportunities to generate CO<sub>2</sub> credits, depending on how Mexico's emissions baseline is set under a trading or crediting program. Similarly, if RECs generated in Mexico are eligible under voluntary or mandatory RECs trading programs in the US or Canada, Mexico could receive additional funds for its power development.

Greenhouse gas emissions trading and credit trading programs are being considered by all three governments to reduce emissions. Canada and Mexico are preparing to participate in the Kyoto

Protocol's market-based mechanisms. In the US, voluntary emissions trading is continuing, and several states are looking at market mechanisms as a way to meet their voluntary and, in some cases mandated, emissions reduction targets.

Fourteen states in the US and the Province of Québec have adopted some form of an RPS requirement. At least seven US RPS programs permit RECs trading. Given the wide support for increased renewable energy development in North America, development of a regional RECs market might provide more near-term results rather than consideration of regional greenhouse gas emissions trading. Further, the institutional framework required for a credible North American RECs market could lay the foundation for a regional greenhouse gas trading program in the future.

A key to a cleaner energy development path for all three nations involves transparent, coordinated and consistent environmental management. Even with differing regulatory foundations and resource capacity, national regulatory agencies working bilaterally and in partnership with regional institutions such as the CEC can help build the infrastructure for market-based mechanisms aimed at common objectives.

The following recommendations are offered to advance consideration of regional market-based programs that would increase renewable energy generation and reduce greenhouse gas emissions:

- When assessing models for regional market-based programs, the following criteria should be sought:
  - strong and credible institutions;
  - flexible program design;
  - economic development and energy development plans;
  - broad-based political support at national and local levels; and
  - use of existing regional frameworks.
- A regional renewable energy certificate and greenhouse gas trading accounting system should be developed in North America. The accounting system should provide a transparent issuing, tracking and certification platform. The establishment of the accounting system would not require agreement on a North American greenhouse gas strategy nor an RPS; it would merely facilitate the transfer of environmental commodities in the region.
- Quantitative analysis should be undertaken to assess the dynamic impacts of RECs trading and greenhouse gas credit and emissions trading in North America – a particular focus should be given to the impacts of these programs on Mexico's economy and electricity markets.



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